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10/534,812	05/13/2005	Kia Silverbrook	MJT006USNP	9048

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AUSTRALIA

EXAMINER	
SOLOMON, LISA	

ART UNIT	PAPER NUMBER
2861	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/534,812	SILVERBROOK, KIA
	Examiner	Art Unit
	LISA M. SOLOMON	2861

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *5/4/2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-50* is/are pending in the application.

4a) Of the above claim(s) *9,10,26,27,42 and 43* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8,11-15,17-25,28-32,34-41 and 44-50* is/are rejected.

7)☒ Claim(s) *16 and 33* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 May 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *5/4/2008*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-3, 5-6, 12, 18-20, 22-23, 29, 35-39, and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weber et al. (6,003,977) in view of Cleland et al. (6,491,377).

In re claim 1, *Weber et al. (977')* teaches an ink jet printhead (12, Fig. 1) configured to receive a supply of ejectable liquid at an ambient temperature [Column 3 lines 25-29], the printhead comprising: a plurality of nozzles (16, 116, Fig. 1 and 4) supported on a substrate (23, Fig. 2) [Column 3 lines 29-36]; and at least one respective heater element (34, 134, Fig. 2 and 4) corresponding to each nozzle (16, 116) [see Fig. 2], wherein each heater element (34, 134) is arranged for being in thermal contact with a bubble forming liquid [Column 3 lines 16-18], each heater element (34, 134) is configured to heat at least part of the bubble forming liquid to a temperature above its boiling point to form therein a collapsible gas bubble (50, 150, Fig. 2 and 4) having a point of collapse (shown as “X”, 156 on Fig. 2 and 4), thereby to cause the ejection of a drop of an ejectable liquid through the nozzle (16) corresponding to that heater element

(34, 134) [Column 4 lines 29-33, See also Fig. 2], and each heater element (34, 134) is configured such that the point of collapse ("X") of a bubble (50, 150) formed thereby is spaced from that heater element (34, 134) [Column 5 lines 37-49]; wherein during use, the heater element (34, 134) generates the gas bubble (50, 150) from an electrical pulse [Column 4 lines 16-23; 29-33]. However, Weber et al. (977') does not teach the electrical pulse has a duration less than 2 microseconds and each heater element is configured such that the energy required to be applied thereto to heat said part to cause the ejection of a said drop is less than the energy required to heat a volume of said ejectable liquid equal to the volume of the said drop, form a temperature equal to said ambient temperature to said boiling point.

Cleland et al. (377') teaches an electrical pulse applied to a heater element having a duration less than 2 microseconds and each heater element is configured such that the energy required to be applied thereto to heat said part to cause the ejection of a said drop is less than the energy required to heat a volume of said ejectable liquid equal to the volume of the said drop, form a temperature equal to said ambient temperature to said boiling point [Column 19 lines 33-39].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide an electrical pulse having a duration less than 2 microseconds and each heater element is configured such that the energy required to be applied thereto to heat said part to cause the ejection of a said drop is less than the energy required to heat a volume of said ejectable liquid equal to the volume of the said drop, form a temperature equal to said ambient temperature to said boiling point as

taught by Cleland et al. (377') in the ink jet printhead of Weber et al. (977') for the purposes of exceeding the turn-on energy of the resistor [Cleland et al. (377') Column 19 lines 36-39].

Note: Cleland et al. (377') does not explicitly teach each heater element is configured such that the energy required to be applied thereto to heat said part to cause the ejection of a said drop is less than the energy required to heat a volume of said ejectable liquid equal to the volume of the said drop, from a temperature equal to said ambient temperature to said boiling point. However, it would be obvious that the energy required to heat a part of the ejectable liquid that contacts the surface of the heater element would be less than it required to heat a volume of ejectable liquid equal to the volume of the drop from an ambient temperature to a boiling point. The amount of ejectable liquid that is to be ejected as a drop contacting the surface of the heater is comparatively smaller than the amount of ejectable liquid that may be in a liquid chamber. Furthermore, there is a response time required for a phase change to occur in the ejectable liquid. The heater is heated to a temperature that is at the boiling point or above the boiling point of the ejectable liquid so that the response time and energy required for the phase change to occur in the ejectable liquid that is to be ejected as a drop contacting the surface of the heater would be less than the response time and energy it would require to heat a volume of the ejectable liquid that may be in a liquid chamber equal to the volume of the drop, from an ambient temperature to a boiling point.

In re claim 2, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the printhead of claim 1[see rejection above]. However, Cleland et al. (377') does not teach the printhead being configured to support the bubble forming liquid in thermal contact with each said heater element, and to support the ejectable liquid adjacent each nozzle.

Weber et al. (977') teaches the printhead being configured to support the bubble forming liquid in thermal contact with each said heater element (34, 134), and to support the ejectable liquid adjacent each nozzle (16, 116) [See Fig. 2]

In re claim 3, *Weber et al. (977') in combination with Cleland et al. (377')* the printhead of claim 1[see rejection above]. However, Cleland et al. (377') does not teach the printhead wherein the bubble forming liquid and the ejectable liquid are of a common body of liquid.

Weber et al. (977') teaches the printhead wherein the bubble forming liquid and the ejectable liquid are of a common body of liquid [Column 3 lines 27-32, Column 4 lines 29-33].

In re claim 5, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the printhead of claim 1[see rejection above]. However, Cleland et al. (377') does not teach the printhead wherein each heater element is configured such that the point of collapse of a bubble formed thereby is at a position at which there is no solid material forming part of the printhead.

Weber et al. (977') wherein each heater element (34,134) is configured such that the point of collapse ("X", 156) of a bubble (50, 150) formed thereby is at a position at which there is no solid material forming part of the printhead (12) [See Figs. 2 and 4].

In re claim 6, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the printhead of claim 1[see rejection above]. However, Cleland et al. (377') does not teach the printhead wherein each heater element has parts defining a gap between them and is configured such that the point of collapse of a bubble formed thereby is within the gap corresponding to that heater element.

Weber et al. (977') wherein each heater element (134, Fig. 4) has parts defining a gap (135, Fig. 4) between them and is configured such that the point of collapse ("X" or 156, Fig. 4) of a bubble (150, Fig. 4) formed thereby is within the gap (135) corresponding to that heater element (134) [Column 5 line 60-Column 6 line 2].

In re claim 12, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the printhead of claim 1[see rejection above]. However, Cleland et al. (377') does not teach the printhead comprising a structure that is formed by chemical vapor deposition (CVD) [not given any patentable weight], each nozzle being incorporated on the structure.

Weber et al. (977') teaches the printhead comprising a structure (22, Fig. 2) that is formed by chemical vapor deposition (CVD) [not given any patentable weight], each nozzle (16, Fig. 2) being incorporated on the structure (22) [Column 3 lines 40-41].

Note: “[E]ven though product-by-process claims are limited by and defined by the process; determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). Therefore, the limitation “formed by chemical vapor deposition” has not been given patentable weight. Only “the structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product”. The limitation “formed by chemical vapor deposition” has not been shown to impart distinctive structural characteristics to the final product.

In re claim 18, *Weber et al. (977')* teaches a printer system (10, Fig. 1) incorporating a printhead (12, Fig. 1) configured to receive a supply of ejectable liquid at an ambient temperature [Column 3 lines 25-29], the printhead (12) comprising: a plurality of nozzles (16, 116, Fig. 1 and 4) [Column 3 lines 29-31]; and at least one respective heater element (34, 134, Fig. 2 and 4) corresponding to each nozzle (16, 116) [see Fig. 2], wherein each heater element (34, 134) is arranged for being in thermal contact with a bubble forming liquid [Column 3 lines 16-18], each heater

element (34, 134) is configured to heat at least part of the bubble forming liquid to a temperature above its boiling point to form therein a collapsible gas bubble (50, 150, Fig. 2 and 4) having a point of collapse (shown as “X”, 156 on Fig. 2 and 4), thereby to cause the ejection of a drop of an ejectable liquid through the nozzle (16) corresponding to that heater element (34, 134) [Column 4 lines 29-33, See also Fig. 2], and each heater element (34, 134) is configured such that the point of collapse (“X”) of a bubble (50, 150) formed thereby is spaced from that heater element (34, 134) [Column 5 lines 37-49]; wherein during use, the heater element (34, 134) generates the gas bubble (50, 150) from an electrical pulse [Column 4 lines 16-23; 29-33]. However, Weber et al. (977’) does not teach the electrical pulse has duration of less than 2 microseconds each heater element is configured such that the energy required to be applied thereto to heat said part to cause the ejection of a said drop is less than the energy required to heat a volume of said ejectable liquid equal to the volume of the said drop, form a temperature equal to said ambient temperature to said boiling point.

Cleland et al. (377’) teaches an electrical pulse applied to a heater element having a duration less than 2 microseconds and each heater element is configured such that the energy required to be applied thereto to heat said part to cause the ejection of a said drop is less than the energy required to heat a volume of said ejectable liquid equal to the volume of the said drop, form a temperature equal to said ambient temperature to said boiling point [Column 19 lines 33-39].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide an electrical pulse having a duration less than 2

microseconds and each heater element is configured such that the energy required to be applied thereto to heat said part to cause the ejection of a said drop is less than the energy required to heat a volume of said ejectable liquid equal to the volume of the said drop, form a temperature equal to said ambient temperature to said boiling point as taught by Cleland et al. (377') in the printer system of Weber et al. (977') for the purposes of exceeding the turn-on energy of the resistor [Cleland et al. (377') Column 19 lines 36-39].

Note: Cleland et al. (377') does not explicitly teach each heater element is configured such that the energy required to be applied thereto to heat said part to cause the ejection of a said drop is less than the energy required to heat a volume of said ejectable liquid equal to the volume of the said drop, from a temperature equal to said ambient temperature to said boiling point. However, it would be obvious that the energy required to heat a part of the ejectable liquid that contacts the surface of the heater element would be less than it required to heat a volume of ejectable liquid equal to the volume of the drop from an ambient temperature to a boiling point. The amount of ejectable liquid that is to be ejected as a drop contacting the surface of the heater is comparatively smaller than the amount of ejectable liquid that may be in a liquid chamber. Furthermore, there is a response time required for a phase change to occur in the ejectable liquid. The heater is heated to a temperature that is at the boiling point or above the boiling point of the ejectable liquid so that the response time and energy required for the phase change to occur in the ejectable liquid that is to be ejected as a drop contacting the surface of the heater would be less than the response time and

energy it would require to heat a volume of the ejectable liquid that may be in a liquid chamber equal to the volume of the drop, from an ambient temperature to a boiling point.

In re claim 19, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the system of claim 18 [see rejection above]. However, Cleland et al. (377') does not teach the system being configured to support the bubble forming liquid in thermal contact with each said heater element, and to support the ejectable liquid adjacent each nozzle.

Weber et al. (977') teaches the system being configured to support the bubble forming liquid in thermal contact with each said heater element (34, 134), and to support the ejectable liquid adjacent each nozzle (16, 116) [See Fig. 2].

In re claim 20, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the system of claim 18 [see rejection above]. However, Cleland et al. (377') does not teach the system wherein the bubble forming liquid and the ejectable liquid are of a common body of liquid.

Weber et al. (977') teaches the system wherein the bubble forming liquid and the ejectable liquid are of a common body of liquid [Column 3 lines 27-32, Column 4 lines 29-33].

In re claim 22, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the system of claim 18 [see rejection above]. However, Cleland et al. (377') does not teach the system wherein each heater element is configured such that the point of collapse of a bubble formed thereby is at a position at which there is no solid material forming part of the printhead.

Weber et al. (977') teaches the system wherein each heater element (34,134) is configured such that the point of collapse ("X", 156) of a bubble (50, 150) formed thereby is at a position at which there is no solid material forming part of the printhead (12) [See Figs. 2 and 4].

In re claim 23, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the system of claim 18 [see rejection above]. However, Cleland et al. (377') does not teach the system wherein each heater element has parts defining a gap between them and is configured such that the point of collapse of a bubble formed thereby is within the gap corresponding to that heater element.

Weber et al. (977') teaches the system wherein each heater element (134, Fig. 4) has parts defining a gap (135, Fig. 4) between them and is configured such that the point of collapse ("X" or 156, Fig. 4) of a bubble (150, Fig. 4) formed thereby is within the gap (135) corresponding to that heater element (134) [Column 5 line 60-Column 6 line 2].

In re claim 29, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the system of claim 18 [see rejection above]. However, Cleland et al. (377') does not teach the system comprising a structure that is formed by chemical vapor deposition (CVD) [not given any patentable weight], each nozzle being incorporated on the structure.

Weber et al. (977') teaches the system comprising a structure (22, Fig. 2) that is formed by chemical vapor deposition (CVD) [not given any patentable weight], each nozzle (16, Fig. 2) being incorporated on the structure (22) [Column 3 lines 40-41].

Note: "[E]ven though product-by-process claims are limited by and defined by the process; determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). Therefore, the limitation "formed by chemical vapor deposition" has not been given patentable weight. Only "the structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product". The limitation "formed by chemical vapor deposition" has not been shown to impart distinctive structural characteristics to the final product.

In re claim 35, *Weber et al. (977')* teaches a method of ejecting a drop of an ejectable liquid from a printhead (12, Fig. 1), the printhead (12) comprising a plurality of nozzles (16, 116, Figs. 1 and 4) and at least one respective heater element (34, 134, Figs. 1 and 4) corresponding to each nozzle (16, 116) [Column 3 lines 29-31, See Fig. 2], the method comprising the steps of: receiving a supply of ejectable liquid, at an ambient temperature [Column 3 lines 25-29], to the printhead; energizing at least one heater element (34, 134, Fig. 1 and 4) corresponding to a nozzle (16, 116) with an electrical pulse so as to heat at least part of a bubble forming liquid which is in thermal contact with the at least one heated heater element (34, 134) to a temperature above the boiling point of the bubble forming liquid [Column 3 lines 16-18, Column 4 lines 16-23; 29-33]; generating a collapsible gas bubble (50, 150, Figs. 2 and 4), having a point of collapse ("X" or 156 as shown on Figs. 2 and 4), in the bubble forming liquid by said step of heating [Column 4 lines 29-33], such that the point of collapse ("X" or 156) is spaced from the at least one heated heater element 934, 134) [Column 5 lines 37-49]; and causing the drop of ejectable liquid to be ejected through the nozzle (16, 116) corresponding to the at least one heated heater element (34, 134) by said step of generating a gas bubble (50, 150) [Column 4 lines 31-33]. However, Weber et al. (977') does not teach the electrical pulse has a duration less than 2 microseconds, and the step of heating is effected by apply heat energy to each such heater element, wherein said applied heat energy is less than the energy required a volume of said ejectable

liquid equal to the volume of the said drop, from a temperature equal to said ambient temperature to said boiling point.

Cleland et al. (377') teaches an electrical pulse applied to a heater element having a duration less than 2 microseconds and the step of heating is effected by apply heat energy to each such heater element, wherein said applied heat energy is less than the energy required a volume of said ejectable liquid equal to the volume of the said drop, from a temperature equal to said ambient temperature to said boiling point [Column 19 lines 33-39].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide an electrical pulse having a duration less than 2 microseconds and the step of heating is effected by apply heat energy to each such heater element, wherein said applied heat energy is less than the energy required a volume of said ejectable liquid equal to the volume of the said drop, from a temperature equal to said ambient temperature to said boiling points taught by Cleland et al. (377') in the method of Weber et al. (977') for the purposes of exceeding the turn-on energy of the resistor [Cleland et al. (377') Column 19 lines 36-39].

Note: Cleland et al. (377') does not explicitly teach each heater element is configured such that the energy required to be applied thereto to heat said part to cause the ejection of a said drop is less than the energy required to heat a volume of said ejectable liquid equal to the volume of the said drop, from a temperature equal to said ambient temperature to said boiling point. However, it would be obvious that the energy required to heat a part of the ejectable liquid that contacts the surface of the heater

element would be less than it required to heat a volume of ejectable liquid equal to the volume of the drop from an ambient temperature to a boiling point. The amount of ejectable liquid that is to be ejected as a drop contacting the surface of the heater is comparatively smaller than the amount of ejectable liquid that may be in a liquid chamber. Furthermore, there is a response time required for a phase change to occur in the ejectable liquid. The heater is heated to a temperature that is at the boiling point or above the boiling point of the ejectable liquid so that the response time and energy required for the phase change to occur in the ejectable liquid that is to be ejected as a drop contacting the surface of the heater would be less than the response time and energy it would require to heat a volume of the ejectable liquid that may be in a liquid chamber equal to the volume of the drop, from an ambient temperature to a boiling point.

In re claim 36, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the method of claim 35 [see rejection above]. However, Cleland et al. (377') does not teach the method comprising, before said step of heating, the steps of: disposing the bubble forming liquid in thermal contact with the heater elements; and disposing the ejectable liquid adjacent the nozzles.

Weber et al. (977') teaches the method comprising before said step of heating, the steps of: disposing the bubble forming liquid in thermal contact with the heater

elements (34, 134) [See Fig. 2]; and disposing the ejectable liquid adjacent the nozzles (16,116) [See Fig. 2].

In re claim 37, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the method of claim 35 [see rejection above]. However, Cleland et al. (377') does not teach wherein the bubble forming liquid and the ejectable liquid are of a common body of liquid.

Weber et al. (977') teaches wherein the bubble forming liquid and the ejectable liquid are of a common body of liquid [Column 3 lines 27-32; Column 4 lines 29-33].

In re claim 38, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the method of claim 35 [see rejection above]. However, Cleland et al. (377') does not teach wherein the step of generating a gas bubble comprises generating the gas bubble such that its point of collapse is at a position at which there is no solid material of the printhead.

Weber et al. (977') teaches wherein the step of generating a gas bubble (50, 150) comprises generating the gas bubble (50, 150) such that its point of collapse ("X" or 156) is at a position at which there is no solid material of the printhead (12) [See Figs. 2 and 4].

In re claim 39, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the method of claim 35 [see rejection above]. However, Cleland et al. (377')

does not teach wherein each heater element has parts defining a gap between them and the step of generating a gas bubble comprises generating the gas bubble such that its point of collapse is within the gap corresponding to the heated heater element.

Weber et al. (977') teaches wherein each heater element (134) has parts defining a gap (135, Fig. 4) between them and the step of generating a gas bubble (150) comprises generating the gas bubble (150) such that its point of collapse ("X" or 156) is within the gap (135) corresponding to the heated heater element (134) [Column 5 line 60-Column 6 line 2].

In re claim 45, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the method of claim 35 [see rejection above]. However, Cleland et al. (377') does not teach a structure that is formed by chemical vapor deposition (CVD) [not given any patentable weight], each nozzle being incorporated on the structure.

Weber et al. (977') teaches the method comprising a structure (22, Fig. 2) that is formed by chemical vapor deposition (CVD) [not given any patentable weight], each nozzle (16, Fig. 2) being incorporated on the structure (22) [Column 3 lines 40-41].

Note: "[E]ven though product-by-process claims are limited by and defined by the process; determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). Therefore, the

limitation “formed by chemical vapor deposition” has not been given patentable weight. Only “the structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product”. The limitation “formed by chemical vapor deposition” has not been shown to impart distinctive structural characteristics to the final product.

Claims 4, 8, 21, 25, and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weber et al. (6,003,977) in view of Cleland et al. (6,491,377) as applied to claims 1-3, 5-6, 18-20, 22-23, and 35-39 above, and further in view of Silverbrook (5,796,416).

In re claim 4, *Weber et al. (977’) in combination with the Cleland et al. (377’)* teaches the printhead of claim 1 [see rejection above]. However, Weber et al. (977’), Cleland et al. (377’), and Okamoto et al. (2002/0182610) do not teach the printhead being configured to print on a page to be a page-width printhead.

Silverbrook (416’) teaches the printhead being configured to print on a page to be a page-width printhead [Column 9 lines 41-48, Column 24 line 63-Column 25 line 6, See also Figs. 1(a) and 4].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the printhead being configured to print on a page to be a

page-width printhead as taught by Silverbrook (416') in the printhead of Weber et al. (977') in combination with Cleland et al. (377') for the purposes of ejecting ink drops on the recording medium in accordance to image data [Column 9 lines 34-40].

In re claim 8, *Weber et al. (977') in combination with the Cleland et al. (377')* teaches the printhead of claim 1 [see rejection above]. However, Weber et al. (977'), Cleland et al. (377'), and Okamoto et al. (2002/0182610) do not teach wherein each heater element is configured such that an actuation energy of less than 500 nanojoules (nJ) is required to be applied to that heater element to heat that heater element sufficiently to form a said bubble in the bubble forming liquid thereby to cause the ejection of a said drop.

Silverbrook (416') teaches wherein each heater element is configured such that an actuation energy of less than 500 nanojoules (nJ) is required to be applied to that heater element to heat that heater element sufficiently to form a said bubble in the bubble forming liquid thereby to cause the ejection of a said drop [Column 11 lines 13-20; 42-52; 54-57; 59-63].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide each heater element to be configured such that an actuation energy of less than 500 nanojoules (nJ) is required to be applied to that heater element to heat that heater element sufficiently to form a said bubble in the bubble forming liquid thereby to cause the ejection of a said drop as taught by Silverbrook

(416') in the ink jet printhead of Weber et al. (977') in combination with Cleland et al. (377') and for the purposes of drop ejection [Silverbrook (416') Column 11 lines 9-12].

In re claim 21, *Weber et al. (977') in combination with the Cleland et al. (377')* teaches the system of claim 18 [see rejection above]. However, Weber et al. (977'), Cleland et al. (377'), and Okamoto et al. (2002/0182610) do not teach the printhead being configured to print on a page to be a page-width printhead.

Silverbrook (416') teaches the printhead being configured to print on a page to be a page-width printhead [Column 9 lines 41-48, Column 24 line 63-Column 25 line 6, See also Figs. 1(a) and 4].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the printhead being configured to print on a page to be a page-width printhead as taught by Silverbrook (416') in the printhead of Weber et al. (977') in combination with Cleland et al. (377') for the purposes of ejecting ink drops on the recording medium in accordance to image data [Column 9 lines 34-40].

In re claim 25, *Weber et al. (977') in combination with the Cleland et al. (377')* teaches the system of claim 18 [see rejection above]. However, Weber et al. (977'), Cleland et al. (377'), and Okamoto et al. (2002/0182610) do not teach wherein each heater element is configured such that an actuation energy of less than 500 nanojoules (nJ) is required to be applied to that heater element to heat that heater element

sufficiently to form a said bubble in the bubble forming liquid thereby to cause the ejection of a said drop.

Silverbrook (416') teaches wherein each heater element is configured such that an actuation energy of less than 500 nanojoules (nJ) is required to be applied to that heater element to heat that heater element sufficiently to form a said bubble in the bubble forming liquid thereby to cause the ejection of a said drop [Column 11 lines 13-20; 42-52; 54-57; 59-63].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide each heater element to be configured such that an actuation energy of less than 500 nanojoules (nJ) is required to be applied to that heater element to heat that heater element sufficiently to form a said bubble in the bubble forming liquid thereby to cause the ejection of a said drop as taught by Silverbrook (416') in the printer system of Weber et al. (977') in combination with Cleland et al. (377') for the purposes of drop ejection [Silverbrook (416') Column 11 lines 9-12].

In re claim 41, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the method of claim 35 [see rejection above]. However, Weber et al. (977'), Cleland et al. (377'), and Okamoto et al. (2002/0182610) do not teach wherein said step of heating at least one heater element is effected by applying an actuation energy of less than 500 nJ to each such heater element.

Silverbrook (416') teaches wherein said step of heating at least one heater element is effected by applying an actuation energy of less than 500 nJ to each such heater element [Column 11 lines 13-20; 42-52; 54-57; 59-63].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide each heater element to be configured such that an actuation energy of less than 500 nanojoules (nJ) is required to be applied to that heater element to heat that heater element sufficiently to form a said bubble in the bubble forming liquid thereby to cause the ejection of a said drop as taught by Silverbrook (416') in the method of Weber et al. (977') in combination with Cleland et al. (377') for the purposes of drop ejection [Silverbrook (416') Column 11 lines 9-12].

Claims 7, 11, 14-15, 17, 24, 28, 31-32, 40, 44, 47-48, and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weber et al. (6,003,977) in view of Cleland et al. (6,491,377) as applied to claims 1-3, 5-6, 12, 18-23, 29, 35-39, and 45 above, and further in view of Kubby et al. (5,706,041).

In re claim 7, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the printhead of claim 1 [see rejection above]. However, Weber et al. (977'), Cleland et al. (377'), and Okamoto et al. (2002/0182610) do not teach wherein each heater element is in the form of a suspended beam, arranged for being suspended over at least a portion of the bubble forming liquid so as to be in thermal contact therewith.

Kubby et al. (041') teaches wherein each heater element is in the form of a suspended beam, arranged for being suspended over at least a portion of the bubble

forming liquid so as to be in thermal contact therewith [Column 3 lines 25-31; 50-61; 64-Column 4 line 4].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide each heater element to be in the form of a suspended beam, suspended over at least a portion of the bubble forming liquid so as to be in thermal contact therewith as taught by Kubby et al. (041') in the printhead of Weber et al. (977') in combination with Cleland et al. (377') for the purposes of increasing the overall heat-transference efficiency of the printhead [Kubby et al. (041') Column 5 lines 13-18].

In re claim 11, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the printhead of claim 1 [see rejection above]. However, Weber et al. (977'), Cleland et al. (377'), and Okamoto et al. (2002/0182610) do not teach wherein each heater element has two opposite sides and is configured such that a said gas bubble formed by that heater element is formed at both of said sides of that element.

Kubby et al. (041') teaches wherein each heater element has two opposite sides and is configured such that a said gas bubble formed by that heater element is formed at both of said sides of that element [Column 4 lines 23-26; 44-50].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide each heater element to have two opposite sides and to be configured such that a gas bubble is formed at both sides of the heater element as taught by Kubby et al. (041') in the printhead of Weber et al. (977') in combination with

Cleland et al. (377') for the purposes of dissipating heat upward and dissipating heat downward [Kubby et al. (041') Column 4 lines 50-52].

In re claim 14, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the printhead of claim 1 [see rejection above]. However, Cleland et al. (377') do not teach the printhead comprising a plurality of nozzle chambers, each corresponding to a respective nozzle, and plurality of heater elements being disposed within each chamber. Weber et al. (977') further teaches the printhead comprising a plurality of nozzle chambers (26, Fig. 2), each corresponding to a respective nozzle (16), and plurality of heater elements (34) being disposed within each chamber (26) [Column 3 lines 25-32; 40-41, See also Fig. 2]. However, Weber et al. (977') does not teach the heater elements within each chamber being formed on different respective layers to one another.

Kubby et al. (041') teaches the heater elements within each chamber being formed on different respective layers to one another [Column 4 lines 23-32; 44-50].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the heater elements within each chamber being formed on different respective layers to one another as taught by Kubby et al. (041') in the inkjet printhead of Weber et al. (977') in combination with Cleland et al. (377') for the purposes of facilitating a more compact and fluidically efficient chip design [Kubby et al. (041') Column 5 lines 18-25].

In re claim 15, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the printhead of claim 1 [see rejection above]. However, Weber et al. (977'), Cleland et al. (377') do not teach each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50.

Kubby et al. (041') teaches each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50 [Column 4 lines 35-50, See also Fig. 4].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50 as taught by Kubby et al. (041') in the printhead of Weber et al. (977') in combination with Cleland et al. (377') for the purposes of creating the heating element [Kubby et al. (041') Column 3 lines 58-61, Column 4 lines 44-50].

Note: Polysilicon is a material constituted of silicon crystals and that a property of silicon is that it has an atomic number of 14.

In re claim 17, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the printhead of claim 1 [see rejection above]. However, Weber et al. (977'), Cleland et al. (377') do not teach wherein each heater element is substantially covered by a conformal protective coating, the coating of each heater element having been

applied substantially to all sides of the heater element simultaneously such that the coating is seamless.

Kubby et al. (041') teaches wherein each heater element is substantially covered by a conformal protective coating, the coating of each heater element having been applied substantially to all sides of the heater element simultaneously such that the coating is seamless [Column 4 lines 38-43].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a conformal protective coating substantially coating each heater element having been applied substantially to all sides of the heater element simultaneously such that the coating is seamless as taught by Kubby et a. (041') in the printhead of Weber et al. (977') in combination with Cleland et al. (377') for the purposes of providing protection of corrosion by the ejectable liquid [Column 4 lines 15-17].

In re claim 24, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the system of claim 18 [see rejection above]. However, Weber et al. (977'), Cleland et al. (377') do not teach wherein each heater element is in the form of a suspended beam, arranged for being suspended over at least a portion of the bubble forming liquid so as to be in thermal contact therewith.

Kubby et al. (041') teaches wherein each heater element is in the form of a suspended beam, arranged for being suspended over at least a portion of the bubble

forming liquid so as to be in thermal contact therewith [Column 3 lines 25-31; 50-61; 64-Column 4 line 4].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide each heater element to be in the form of a suspended beam, suspended over at least a portion of the bubble forming liquid so as to be in thermal contact therewith as taught by Kubby et al. (041') in the system of Weber et al. (977') in combination with Cleland et al. (377') for the purposes of increasing the overall heat-transference efficiency of the printhead [Kubby et al. (041') Column 5 lines 13-18].

In re claim 28, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the system of claim 18 [see rejection above]. However, Weber et al. (977'), Cleland et al. (377'), and Okamoto et al. (2002/0182610) do not teach wherein each heater element has two opposite sides and is configured such that a said gas bubble formed by that heater element is formed at both of said sides of that element.

Kubby et al. (041') teaches wherein each heater element has two opposite sides and is configured such that a said gas bubble formed by that heater element is formed at both of said sides of that element [Column 4 lines 23-26; 44-50].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide each heater element to have two opposite sides and to be configured such that a gas bubble is formed at both sides of the heater element as taught by Kubby et al. (041') in the system of Weber et al. (977') in combination with

Cleland et al. (377') for the purposes of dissipating heat upward and dissipating heat downward [Kubby et al. (041') Column 4 lines 50-52].

In re claim 31, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the system of claim 18 [see rejection above]. However, Cleland et al. (377') do not teach the system comprising a plurality of nozzle chambers, each corresponding to a respective nozzle, and plurality of heater elements being disposed within each chamber. Weber et al. (977') further teaches the system comprising a plurality of nozzle chambers (26, Fig. 2), each corresponding to a respective nozzle (16), and plurality of heater elements (34) being disposed within each chamber (26) [Column 3 lines 25-32; 40-41, See also Fig. 2]. However, Weber et al. (977') does not teach the heater elements within each chamber being formed on different respective layers to one another.

Kubby et al. (041') teaches the heater elements within each chamber being formed on different respective layers to one another [Column 4 lines 23-32; 44-50].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the heater elements within each chamber being formed on different respective layers to one another as taught by Kubby et al. (041') in the inkjet system of Weber et al. (977') in combination with Cleland et al. (377') for the purposes of facilitating a more compact and fluidically efficient chip design [Kubby et al. (041') Column 5 lines 18-25].

In re claim 32, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the system of claim 18 [see rejection above]. However, Weber et al. (977'), Cleland et al. (377'), and Okamoto et al. (2002/0182610) do not teach each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50.

Kubby et al. (041') teaches each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50 [Column 4 lines 35-50, See also Fig. 4].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50 as taught by Kubby et al. (041') in the system of Weber et al. (977') in combination with Cleland et al. (377') for the purposes of creating the heating element [Kubby et al. (041') Column 3 lines 58-61, Column 4 lines 44-50].

Note: Polysilicon is a material constituted of silicon crystals and that a property of silicon is that it has an atomic number of 14.

In re claim 34, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the system of claim 18 [see rejection above]. However, Weber et al. (977') and Cleland et al. (377') do not teach each heater element is substantially covered by a conformal protective coating, the coating of each heater element having been applied

substantially to all sides of the heater element simultaneously such that the coating is seamless.

Kubby et al. (041') teaches wherein each heater element is substantially covered by a conformal protective coating, the coating of each heater element having been applied substantially to all sides of the heater element simultaneously such that the coating is seamless [Column 4 lines 38-43].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a conformal protective coating substantially coating each heater element having been applied substantially to all sides of the heater element simultaneously such that the coating is seamless as taught by Kubby et a. (041') in the system of Weber et al. (977') in combination with Cleland et al. (377') for the purposes of providing protection of corrosion by the ejectable liquid [Column 4 lines 15-17].

In re claim 40, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the method of claim 35 [see rejection above]. However, Weber et al. (977'), Cleland et al. (377') do not teach wherein each said heater element is in the form of a suspended beam, the method further comprising, prior to the step of heating at least one heater element, the step of disposing the bubble forming liquid such that the heater elements are positioned above, and in thermal contact with, at least a portion of the bubble forming liquid.

Kubby (041') teaches wherein each said heater element is in the form of a suspended beam [Column 3 lines 25-31; 50-61; 64-Column 4 line 4] and prior to the

step of heating at least one heater element, the step of disposing the bubble forming liquid such that the heater elements are positioned above, and in thermal contact with, at least a portion of the bubble forming liquid [Column 5 lines 4-11].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide each heater element to be in the form of a suspended beam and prior to the step of heating at least one heater element, the step of disposing the bubble forming liquid such that the heater elements are positioned above, and in thermal contact with at least a portion of the bubble forming liquid as taught by Kubby et al. (041') in the method of Weber et al. (977') in combination with Cleland et al. (377') for the purposes of increasing the overall heat-transference efficiency of the printhead [Kubby et al. (041') Column 5 lines 13-18].

In re claim 44, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the method of claim 35 [see rejection above]. However, Weber et al. (977'), Cleland et al. (377'), and Okamoto et al. (2002/0182610) do not teach wherein each heater element has two opposite sides, and wherein, in the step of generating a gas bubble, the bubble is generated at both of said sides of each heater element.

Kubby (041') teaches wherein each heater element has two opposite sides, and wherein, in the step of generating a gas bubble, the bubble is generated at both of said sides of each heater element [Column 4 lines 23-26; 44-50].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide each heater element to have two opposite sides and to

be configured such that a gas bubble is formed at both sides of the heater element as taught by Kubby et al. (041') in the method of Weber et al. (977') in combination with Cleland et al. (377') for the purposes of dissipating heat upward and dissipating heat downward [Kubby et al. (041') Column 4 lines 50-52].

In re claim 47, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the method of claim 35 [see rejection above]. However, Cleland et al. (377') do not teach the method wherein the printhead has a plurality of nozzle chambers, each corresponding to a respective nozzle, and plurality of heater elements being disposed within each chamber. Weber et al. (977') further teaches the method wherein the printhead has a plurality of nozzle chambers (26, Fig. 2), each corresponding to a respective nozzle (16), and plurality of heater elements (34) being disposed within each chamber (26) [Column 3 lines 25-32; 40-41, See also Fig. 2]. However, Weber et al. (977') does not teach the heater elements within each chamber being formed on different respective layers to one another.

Kubby (041') teaches the method further comprising the step of providing the printhead including forming a plurality of said heater elements in each chamber, such that the heater elements in each chamber are formed on different respective layers to one another [Column 4 lines 23-32; 44-50].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the step of forming the heater elements in each chamber such that the heater elements within each chamber being formed on different respective

layers to one another as taught by Kubby et al. (041') in the method of Weber et al. (977') in Cleland et al. (377') for the purposes of facilitating a more compact and fluidically efficient chip design [Kubby et al. (041') Column 5 lines 18-25].

In re claim 48, *Weber et al. (977') in combination with Cleland et al. (377')* teaches the method of claim 35 [see rejection above]. However, Weber et al. (977'), Cleland et al. (377') do not teach the step of providing the printhead wherein each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50.

Kubby (041') teaches the step of providing the printhead wherein each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50 [Column 4 lines 35-50, See also Fig. 4].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the step wherein each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50 as taught by Kubby et al. (041') in the method of Weber et al. (977') in combination with Cleland et al. (377') for the purposes of creating the heating element [Kubby et al. (041') Column 3 lines 58-61, Column 4 lines 44-50].

Note: Polysilicon is a material constituted of silicon crystals and that a property of silicon is that it has an atomic number of 14.

In re claim 50, *Weber et al. (977') in combination with Cleland et al. (377') and Okamoto et al. (2002/0182610)* teaches the method of claim 35 [see rejection above]. However, Weber et al. (977'), Cleland et al. (377') do not teach the step of providing the printhead, including applying to each heater element substantially to all sides thereof simultaneously, a conformal protective coating such that the coating is seamless.

Kubby et al. (041') teaches the step of providing the printhead, including applying to each heater element substantially to all sides thereof simultaneously, a conformal protective coating such that the coating is seamless [Column 4 lines 38-43].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the step of providing the printhead, including applying to each heater element substantially to all sides thereof simultaneously, a conformal protective coating such that the coating is seamless as taught by Kubby et a. (041') in the printhead of Weber et al. (977') in combination with Cleland et al. (377') for the purposes of providing protection of corrosion by the ejectable liquid [Column 4 lines 15-17].

Claims 13, 30, and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weber et al. (6,003,977) in view of Cleland et al. (6,491,377).

In re claims 13, 30, 46, *Weber et al. (977') in combination with Cleland et al. (377')* teaches all the claimed limitation except a structure that is less than 10 microns thick. It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a structure that is less than 10 microns thick, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Allowable Subject Matter

4. Claims 16 and 33 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The primary reason for the allowance of claims 16 and 33 is the inclusion of the limitations of a printhead and a method that includes wherein each heater element includes solid material and is configured for a mass of less than 10 nanograms of the solid material of that heater element to be heated to a temperature above said boiling point thereby to heat said part of the bubble forming liquid to a temperature above said boiling point thereby to cause the ejection of a said drop" (claims 16 and 33). It is these limitations found in the claims, as they are claimed in the combination that has not been found, taught or suggested by the prior art of record, which makes these claims allowable over the prior art.

Response to Arguments

5. Applicant's arguments with respect to claims 1-8, 11-25, 28-41, 44-50 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LISA M. SOLOMON whose telephone number is (571)272-1701. The examiner can normally be reached on Monday - Friday from 8:00 am - 4:30 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Luu can be reached on (571) 272-7663. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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